

A Monograph on Ghatti Gum

9/6/72

GUM GHATTI

A MONOGRAPH

on

GUM GHATTI

to

Food and Drug Administration
Department of Health, Education and Welfare

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SUMMARY

Gum ghatti is derived from a gummy exudate of the Anogeissus latifolia tree.⁽⁹⁾ It is known to be a calcium salt of ghattic acid which is a complex polymer containing galactose, mannose, xylose and glucuronic acid.⁽¹⁶⁾ Its structural formula has not been fully defined. The water soluble portion of the gum, which accounts for 90 percent, has a molecular weight of 11,860.⁽⁶⁾

While gum ghatti is used in several non-food applications such as oil drilling muds, its food use is extremely limited, amounting to less than 5,000 pounds per year.

No studies have been reported on the absorption and metabolism of this gum or of its toxicity.

CHEMICAL INFORMATIONNomenclatureCommon Names

Gum ghatti

Gum ghati

Indian gum

Chemical Name - NoneTrade Name - Gum GhattiChemical Abstracts Services UniqueRegistry Number PM9000286Empirical Formula

The empirical formula of gum arabic is undefined.

Structural Formula

Gum ghatti is the calcium salt of the polysaccharide acid, ghatic acid. Its structural formula has not been determined. When hydrolyzed with dilute acid the polysaccharide yields L-arabinose (5 moles), D-galactose (3 moles), D-mannose (1 mole), D-xylose (0.5 mole) and D-glucuronic acid (1 mole). Smith and Montgomery⁽¹⁶⁾ have reviewed the structural properties of gum ghatti as known. Elworthy and George⁽²⁾ present additional data on the molecular properties as measured by viscosity and light scattering methods.

Molecular Weight

Approximately 90% of gum ghatti is water soluble. The soluble portion has a molecular weight of 11,860 as determined by osmotic pressure measurements.⁽⁶⁾

Specifications

Three grades of gum ghatti are imported to the United States as shown in Table I.⁽⁵⁾

TABLE I. GHATTI GRADES

Grade	Impurities, %	Total Ash, %	Acid-insoluble Ash, %	Viscosity, cp. (5%)	Moisture %
1	0.40-1.30	1.60-2.20	0.02-0.15	40-300	12-14
2	1.50-2.70	2.90-3.30	0.20-0.30	40-250	12-14
3	4.00-5.00	3.20-4.00	0.30-0.80	30-200	12-15

The imported tears are further processed by grinding, sifting, aspiration and density-table separation to remove impurities. No further specifications are available in the literature.

Description

General Characteristics⁽⁹⁾

As harvested from the Anogeissus latifolia tree, gum ghatti tears are amorphous and vary in color from light to dark brown. These tears are sorted into grades according to color and impurities. The sorted tears are ground and further processed by sifting, aspiration and density table separation to remove impurities. The final powder is about 150 mesh and varies from gray to reddish-gray depending on the grade. It has a bland taste and little or no odor.

Physical Properties

Approximately 90 percent of powdered gum ghatti is soluble in water. Glicksman⁽⁹⁾ reports that the gum yields a colloidal dispersion having a pH of about 4.5 which is naturally buffered against small amounts of acid or alkali. Fleischer⁽⁵⁾ reports that the pH of an aqueous solution after dialysis is 5.5.

Gum ghatti solutions form a fine precipitate with Millon's reagent and a translucent, flocculent precipitate with basic lead acetate. Ethanol addition causes a fine, flocculent precipitate and leads to gel formation at a level of 90 percent ethanol.⁽⁵⁾

Stability

No data have been reported on the stability of gum ghatti in the dry form. Presumably it is quite stable. Fleischer⁽⁵⁾ reports that gum ghatti solutions are subject to fermentation by molds and yeasts.

Analytical Methods

The isolation and identification of gums in food products is a complex problem which requires a different approach for each specific product under consideration. Several good reviews of existing methods are available^(3,9,16) Specific methods for the separation and identification of gums in the following food products have been adopted by the Association of Official Analytical Chemists:⁽⁸⁾

Ice Cream and Frozen Desserts, 16.231-16.237

Mayonnaise and French Dressing, 30.051

Salad Dressing, 30.052-30.054

Soft Curd Cheese, 16.211-16.214

No satisfactory method has been developed for the quantitative determination of gum ghatti in food products.

Occurance and Levels

True gum ghatti is only found naturally in the Anogeissus latifolia tree, although gums of different botanical origin, such as gum shiraz are sometimes sold as gum ghatti by exporters.

No synthetic forms of gum ghatti exist.

BIOLOGICAL DATA

Acute Toxicity

No acute toxicity studies on gum ghatti have been reported in the literature.

Short Term Studies

No short term toxicity studies on gum ghatti have been reported in the literature.

Long Term Studies

No long term toxicity studies on gum ghatti have been reported in the literature.

Special Studies

No studies on the mutagenicity, teratogenicity or carcinogenicity of gum ghatti have been reported in the literature.

BIOCHEMICAL ASPECTS

Breakdown

No data have been reported in the literature on the spontaneous breakdown of gum ghatti in food under reasonable conditions of storage and processing or cooking.

Absorption-Distribution Metabolism and Excretion

No studies have been reported in the literature on the metabolic fate of gum ghatti.

Interaction With Food and Drugs

There are no reported data available on the interaction of gum ghatti with food or drugs.

CONSUMER EXPOSURE INFORMATION

Preliminary data collected by NAS indicate that the total amount of gum ghatti used by food processors in 1970 was 4,466 pounds. One reported food use is as an emulsion stabilizer in butter-containing table syrup.⁽¹⁸⁾

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Summary Only

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ACADEMY OF SCIENCE

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**STUDIES ON THE CHEMICAL CONSTITUTION OF
GUM GHATTI**

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Gum ghatti is 90% soluble, the soluble portion consisting of the calcium salt of a polysaccharide acid, ghattic acid. Free ghattic acid is isolated by alcohol precipitation, pK 3.3, equivalent weight 1735. The molecular weight of the soluble portion of gum ghatti was determined by osmotic pressure measurements to be 11,860, corresponding to a tri-calcium salt of equivalent weight 1957. The soluble portion of gum ghatti was shown to contain 0.72% nitrogen, corresponding to an equivalent weight of 1950.

On the hydrolysis of gum ghatti with sulfuric acid, the specific rotation changed from -42° to $+58^{\circ}$. From the hydrolysis mixture, l-arabinose was isolated, together with the barium salt of an aldobionic acid, pK 3.2, equivalent weight 352. Hydrolysis with oxalic acid yielded arabinose and degraded gums of low arabinose content. Analysis indicated that ghattic acid contains 50% pentosan and at least 12% of galactose or galacturonic acid. Methylation studies on hydrolyzed gum ghatti were begun.

**COLOR PHOTOGRAPHY IN THE TEACHING OF
PLANT ANATOMY**

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Four types of transparent slides were projected on the screen in demonstration of this paper: (1) photomicrographs in full color on Kodachrome film, (2) black-and-white photographs of camera lucida drawings finished in black ink, (3) color photographs of drawings finished in colored inks, and (4) color photographs of drawings finished in colored pencils.

Drawings finished in colored inks and then photographed in color have the same teaching advantages over photomicro-